

# (12) UK Patent Application (19) GB (11) 2 165 868 A

(43) Application published 23 Apr 1986

(21) Application No 8424365

(22) Date of filing 27 Sep 1984

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(51) INT CL<sup>4</sup>  
E04C 2/26

(52) Domestic classification  
E1D 195 2150 401 402 423 CF2  
U1S 1348 1380 E1D

(56) Documents cited  
None

(58) Field of search  
E1D  
E1K

(54) Composite plastic/metal sheet

(57) A flexible metallic sheet or liner system in which high loadings of a particulate metal is bound together using a polyether block amide elastomer. The binder system may be substituted in part by polyisobutylene. The components of this system may be intimately compounded by either "dry" mixing at relatively high temperatures and high shear or by solvent compounding using a suitable solvent such as n - butanol.

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## SPECIFICATION

## Fully flexible, self supporting, metallic liner or sheet systems

5 This invention relates to novel fully flexible and self supporting metallic liner or sheet systems. 5

More particularly the present invention relates to the finding that a relatively novel thermoplastic copolymer (a polyester block amide) serves as an extremely practical binder matrix to envelop extremely high loadings of metallic powders and flakes.

Even more particularly, the present invention relates to the finding that the thermoplastic copolymer 10 binding system used in the invention serves as a practical binder matrix to envelop extremely high loadings from 90% to 97.5% by weight) of finely divided metal powder and/or flake, with the specific purpose of creating a fully flexible metal sheet for use as the cavity liner in a high explosive 'shaped charge', of either the cylindrical, conical or linear-cutting type charge. 10

The thermoplastic polymeric binder system used in the present invention to envelop these extremely 15 high loadings of metal powder or flake is a polyether amide block copolymer termed PEBAX RTM and manufactured in France by ATOChemie, and available in the U.K. The particularly preferred grade of PEBAX RTM for this use is termed 2533SN00. 15

The metal flake is added in order to take up voids in the atomised powder to achieve as high a bulk loading as possible. From this it would be possible to obtain a very high loading using a suitable blend 20 of particle sizes in order to reach the highest practical density of loading. 20

The following composition serves as an example to illustrate the nature of the invention:-  
PEBAX 2533SN00 10g is dissolved in n-Butanol (about 150g). Once fully incorporated the solvent can be evaporated off to at least half volume when 80g atomised (200 - 20 u particle size) copper powder together with 10g flake particle size

25 (200 - 20 u) copper is mixed in and solvent further evaporated off to leave a mixture with a putty-like consistency suitable for filling moulds or liners. With all the solvent removed this plastic/copper mix can then be granulated to a size suitable for further processing on extrusion machinery. In this way any size or length could be made. It is suggested that following extrusion and quenching to the required shape a suitable possibly plastic-type explosive could be bonded to the surface of the liner. 25

30 A further example to yield a more physically formable composition is given below:- 30

	PEBAX	7g	
	+Polyisobutylene	3g	
35	=Copper powder	80g	
	=Copper flake	10g	35

These ratios can be blended in the same way as the previous example but blending the PEBAX with 40 the polyisobutylene together in the solvent. 40

+Polyisobutylene is well known as a common tackifier/extender used in this case to reduce elastic "memory". e.g. VISTANEX LMMHRTM Polybutylene from EXON CHEMICALS.

=Both types of copper were obtained from Wolstenholme Bronze.

#### 45 CLAIMS 45

1. An elastomer bound metallic sheet system which comprises a block copolymer of a polyether polyamide as the binder.

2. A composition as described in claim 1) in which the binder content lies in the range 2.5% - 10% by 50 weight of the composition. 50

3. A composition as described in claim 1) which is extended by up to 50% by weight of binder using polyisobutylene.

4. A composition as described in claim 1) or 2) in which the particulate metal component comprises copper.

55 5. A composition as described in claim 4) in which the particle size of the metal component lies in the range 200 - 20. 55

6. A composition comprising an agent as described in any one of claims 1) to 5).